

CLAIMS

1. A phosphorescent phosphor comprising a compound expressed by MA_2O_4 as a matrix in which M comprises of strontium (Sr) and barium (Ba), europium (Eu) doped to said matrix as an activator, and dysprosium (Dy) doped to said matrix as a co-activator;

an amount of said doped europium (Eu) being more than 1.5% and not more than 5% in terms of mol% relative to a total mole number of the metal elements expressed by M, europium (Eu) and dysprosium (Dy);

an amount of said doped dysprosium (Dy) ranging $0.3 \leq Dy/Eu \leq 2$ in terms of a molar ratio relative to europium (Eu);

a ratio of aluminum (Al) ranging from 2.1 to 2.9 in terms of a molar ratio relative to a total mole number of the metal elements expressed by M, europium (Eu) and dysprosium (Dy); and

a ratio of barium (Ba) to M ranging $0.03 \leq Ba/(Sr+Ba) \leq 0.2$.

2. A phosphorescent phosphor comprising a compound expressed by MA_2O_4 as a matrix in which M comprises of strontium (Sr) and calcium (Ca), europium (Eu) doped to said matrix as an activator, and dysprosium (Dy) doped to said matrix as a co-activator;

an amount of said doped europium (Eu) being more than 1.5% and not more than 5% in terms of mol% relative to a total

mole number of the metal elements expressed by M, europium (Eu) and dysprosium (Dy);

an amount of said doped dysprosium (Dy) ranging $0.3 \leq \text{Dy}/\text{Eu} \leq 2$ in terms of a molar ratio relative to europium (Eu);

a ratio of aluminum (Al) ranging from 2.1 to 2.9 in terms of a molar ratio relative to the total mole number of the metal elements expressed by M, europium (Eu) and dysprosium (Dy); and

a ratio of calcium (Ca) to M ranging $0.005 \leq \text{Ca}/(\text{Sr} + \text{Ca}) \leq 0.1$.

3. A phosphorescent phosphor comprising a compound expressed by MAl_2O_4 as a matrix in which M comprises of strontium (Sr), barium (Ba) and calcium (Ca), europium (Eu) doped to said matrix as an activator, and dysprosium (Dy) doped to said matrix as a co-activator;

an amount of said doped europium (Eu) being more than 1.5% and not more than 5% in terms of mol% relative to a total mole number of the metal elements expressed by M, europium (Eu) and dysprosium (Dy);

an amount of said doped dysprosium (Dy) ranging $0.3 \leq \text{Dy}/\text{Eu} \leq 2$ in terms of a molar ratio relative to europium (Eu);

a ratio of aluminum (Al) ranging from 2.1 to 2.9 in terms of a molar ratio relative to the total mole number of the metal elements expressed by M, europium (Eu) and dysprosium (Dy);

a ratio of barium (Ba) to M ranging
 $0.03 \leq \text{Ba} / (\text{Sr} + \text{Ba} + \text{Ca}) \leq 0.145$;
a ratio of calcium (Ca) to M ranging
 $0.005 \leq \text{Ca} / (\text{Sr} + \text{Ba} + \text{Ca}) \leq 0.05$; and
a total ratio of barium (Ba) and calcium (Ca) to M ranging
 $0.035 \leq (\text{Ba} + \text{Ca}) / (\text{Sr} + \text{Ba} + \text{Ca}) \leq 0.15$.

4. A method of manufacturing an alkaline-earth metal aluminate phosphorescent phosphor, wherein:

an aluminum (Al) compound, a strontium (Sr) compound, a barium (Ba) compound, a europium (Eu) compound and a dysprosium (Dy) compound are mixed so that molar ratios of the elements meet following requirements:

$$\begin{aligned} 0.015 < \text{Eu} / (\text{Sr} + \text{Ba} + \text{Eu} + \text{Dy}) &\leq 0.05, \\ 0.3 &\leq \text{Dy} / \text{Eu} \leq 2, \\ 0.03 &\leq \text{Ba} / (\text{Sr} + \text{Ba}) \leq 0.2 \text{ and} \\ 2.1 &\leq \text{Al} / (\text{Sr} + \text{Ba} + \text{Eu} + \text{Dy}) \leq 2.9; \text{ and} \end{aligned}$$

a resultant mixture is fired in a reductive atmosphere, and then cooled and ground.

5. A method of manufacturing an alkaline-earth metal aluminate phosphorescent phosphor, wherein:

an aluminum (Al) compound, a strontium (Sr) compound, a calcium (Ca) compound, a europium (Eu) compound and a dysprosium (Dy) compound are mixed so that molar ratios of the elements meet following requirements:

$$0.015 < \text{Eu} / (\text{Sr} + \text{Ca} + \text{Eu} + \text{Dy}) \leq 0.05,$$

$$0.3 \leq \text{Dy}/\text{Eu} \leq 2,$$

$$0.005 \leq \text{Ca}/(\text{Sr}+\text{Ca}) \leq 0.1 \text{ and}$$

$$2.1 \leq \text{Al}/(\text{Sr}+\text{Ca}+\text{Eu}+\text{Dy}) \leq 2.9; \text{ and}$$

a resultant mixture is fired in a reductive atmosphere, and then cooled and ground.

6. A method of manufacturing an alkaline-earth metal aluminate phosphorescent phosphor, wherein:

an aluminum (Al) compound, a strontium (Sr) compound, a barium (Ba) compound, a calcium (Ca) compound, a europium (Eu) compound and a dysprosium (Dy) compound are mixed so that molar ratios of the elements meet following requirements:

$$0.015 < \text{Eu}/(\text{Sr}+\text{Ba}+\text{Ca}+\text{Eu}+\text{Dy}) \leq 0.05,$$

$$0.3 \leq \text{Dy}/\text{Eu} \leq 2,$$

$$0.03 \leq \text{Ba}/(\text{Sr}+\text{Ba}+\text{Ca}) \leq 0.145,$$

$$0.005 \leq \text{Ca}/(\text{Sr}+\text{Ba}+\text{Ca}) \leq 0.05,$$

$$0.035 \leq (\text{Ba}+\text{Ca})/(\text{Sr}+\text{Ba}+\text{Ca}) \leq 0.15 \text{ and}$$

$$2.1 \leq \text{Al}/(\text{Sr}+\text{Ba}+\text{Ca}+\text{Eu}+\text{Dy}) \leq 2.9; \text{ and}$$

a resultant mixture is fired in a reductive atmosphere, and then cooled and ground.

7. The method of manufacturing an alkaline-earth metal aluminate phosphorescent phosphor according to claim 4, 5 or 6, wherein a boron compound as flux is added to a raw material; and the resultant mixture is fired.